

## SINGLE DECADE COUNTING RELAYS

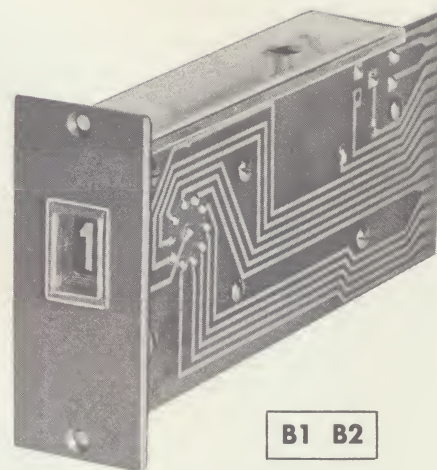
The single decade counting relays B1, B2 or B3 are pulse driven stepping switches with count-up single unit advance for each applied pulse. Any source that is capable of supplying an electrical pulse within specifications can be counted. Applied to data handling and control systems, these units are versatile and valuable components.

### FEATURES

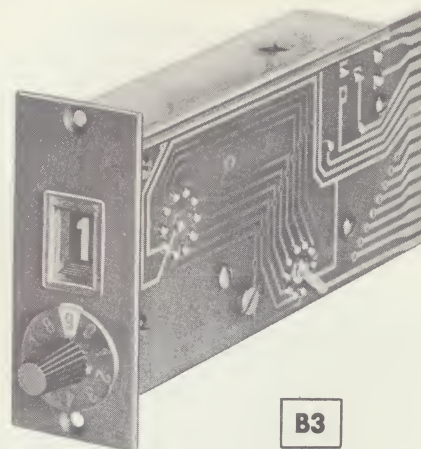
- Direct visual and remote electrical readout.
- Electrical reset.
- Transfer pulse---when passing from 9 to 0.
- Preset counting----anywhere between 1 and 9.

The single decade units can be cascaded to form a totalizing counter of any digit capacity, and can provide control information at any predetermined numbers. The total of events is displayed in an easily readable in-line register.

In a multiple unit installation, each counting relay can be controlled independently and information can be applied serially or in parallel, which makes the unit applicable as an accumulator or a register. It also allows for a format conversion — series-in parallel-out, or parallel-in series-out — and allows for programming of the group. It can function as a pre-set counter controller, and can be set for any predetermined count from 1 to the register capacity. As a computer the units can be instrumented to add, subtract and draw balances. As a control element in a programmed sequence, the unit can provide switch closures, generate variable pulse intervals for gates, initiate and terminate programmed operations by number, etc. Its storage is non-destructive and it will hold stored data whether power is on or off.



B1 B2



B3



Typical  
Totalizing Counter Assembly



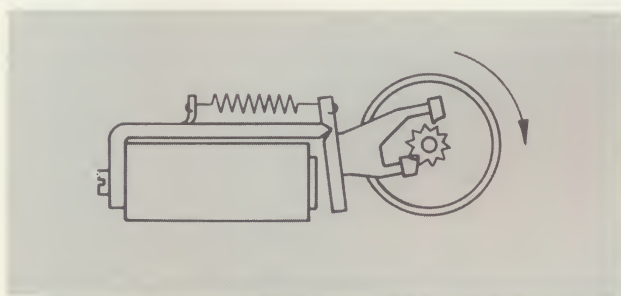
## CONSTRUCTION OF THE EICO COUNTING RELAY

The counting relay is made up of four parts:

1. Electro-mechanical drive
2. Digit transfer contacts
3. Zero setting contacts
4. Electrical readout step switch

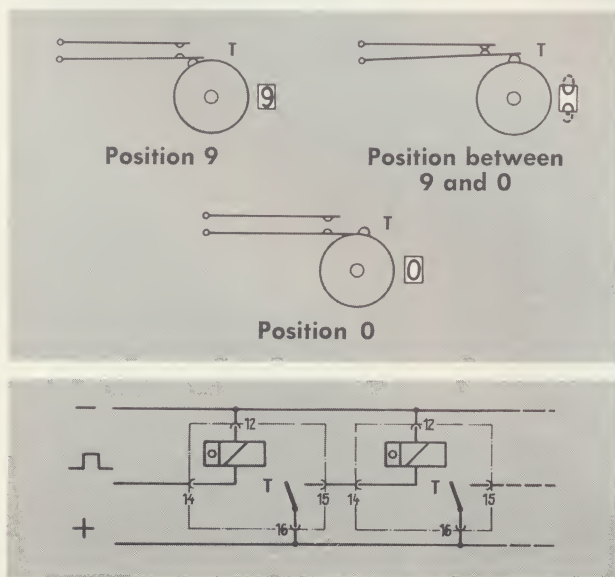
### ELECTRO-MECHANICAL DRIVE

An electromagnet drives the action lever of the number cylinder. The incoming impulse activates the cylinder and rotates it  $18^\circ$ . At the end of the impulse, the cylinder turns another  $18^\circ$  by means of the energy stored in the spring. The drive system is mounted on a deck of nonmagnetic material.



### DIGIT TRANSFER CONTACTS (T)

The digit transfer contacts (T) close when the cylinder is between the numbers 9 & 0. They activate the drivemagnet of the next counter. The operation of the contacts is shown in the illustration below. The diagram shows the use of the transfer contacts in the construction of a group counter.

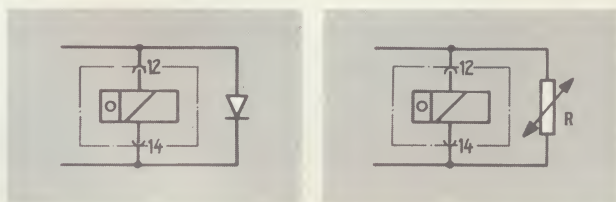


When using the transfer contacts, one must take notice of two things:

- A. If the first relay of a many-digit group counter is activated, it takes a certain interval before the relays of subsequent decades respond. (This is important in figuring the speed for coincidence circuitry).
- B. If one attaches additional relays or loads across the transfer contacts, one must avoid arcing, lest the contacts burn out too early.

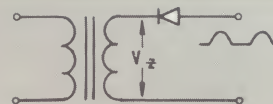
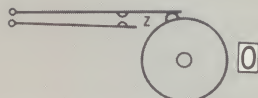
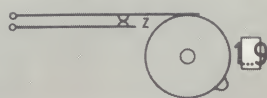
Below are shown the different ways to avoid arcing. In making a choice, please consider the following:

Most effective spark suppression is obtained with a diode. However, the delay interval is increased. If the counting relay is brought to the null position at a rate of 60 impulses per second, the diode has to be disconnected during the zeroing period. The same is true in using an RC combination. A rheostat avoids this drawback. However, a rheostat is not as effective as a diode circuit. The choice of spark suppression circuit has to depend on application.



### ZERO SETTING CONTACTS (Z)

Zero settings on the counting relays are made possible by feeding a series of impulses to the drive coil through the zero-setting contacts. When the cylinder reaches the zero position, the (Z) contacts open and interrupt the conduction of the impulses to the drive coil. In most cases, half-wave rectified power frequencies (up to 60 cycles) can be used for zero-setting voltage. However, the peak voltage entering the rectifier must be at least twice the voltage required to drive the counting relay. In the case of counting relays requiring 24V, the zero-setting voltage must be at least 48V peak.



The Schematic, as shown in Figure A, shows a group counter with the zero-setting drive voltage connected to the contacts. The multi-contact switch can be activated either by a

pushbutton or by a solenoid relay.

If one uses a circuit with a coupled diode, only a SPST switch is necessary for activation. (See Figure B).

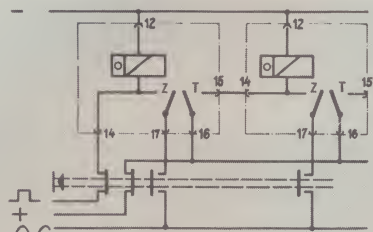


Figure A

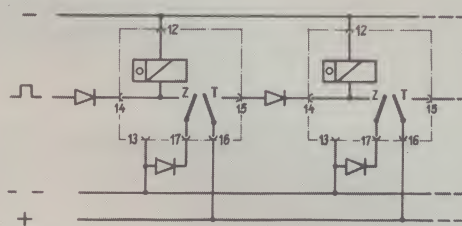


Figure B

### STEPPING SWITCH (ELECTRICAL READOUT)

The stepping switch consists of ten stationary contacts secured to the printed circuit board, and of a rotating contact coupled to the number cylinder. Each position of the stepping switch corresponds to a position of the number cylinder. Thus the contents of the counting relay can be read electrically as well as

visually. The electric readout facility allows the relay to be used for control, storage and processing of data.

All contacts are silver plated.

Type B1 has shorting type contacts.

Type B2 and B3 have non-shorting contacts.

### ELECTRICAL SPECIFICATIONS

Driving voltage .....	24 volts $\pm 10\%$
Coil resistance .....	140 ohms $\pm 10\%$
Maximum impulse rate .....	25 imp/sec at full driving voltage and undamped condition
Maximum load for 30 minutes insertion .....	5 watts
Minimum pulse width .....	10 milliseconds
Temperature range .....	$-20^{\circ}\text{C}$ to $+80^{\circ}\text{C}$
Isolation .....	All current carrying parts to housing 1200 volts
Life expectancy .....	Minimum 40 million operations
Transfer contact capacity .....	50V @ 200mA or 10 watts with spark suppression
Zero setting contact capacity .....	50V @ 200mA or 10 watts with spark suppression
Readout contact capacity .....	
Dynamic load .....	24 Volts @ 200mA with spark suppression
Static load .....	110 volts @ 1 Amp
Zero setting voltage .....	Half-wave rectified 60 cycle sine wave; twice amplitude of driving voltage



## SPECIAL COILS

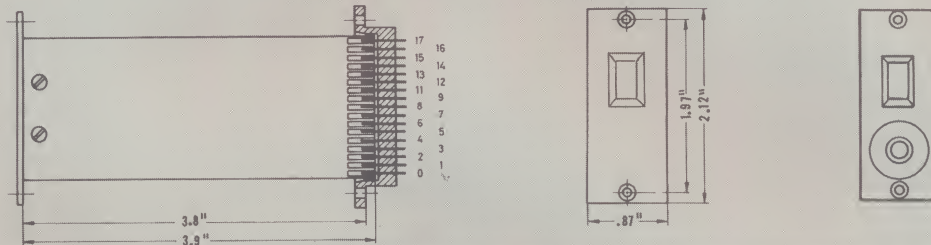
V	15 imp/sec			25 imp/sec		
	Ohm	mA	W	Ohm	mA	W
6	10	600	3.6	8	750	4.5
12	50	240	2.9	36	333	4
24	190	127	3	Standard Coil		
42	510	82	3.5	370	113	4.8
60	1230	49	3	790	76	4.6

Coil resistance tolerance  $\pm 10\%$

### WHEN ORDERING, PLEASE NOTE:

In addition to type, the driving voltage and maximum impulse rate must be specified. For example: If the counting relay Type B1 for 42 Volts and 15 imp/sec is desired, give the following order number; B1-42-15

### MECHANICAL SPECIFICATIONS



#### B1 NON-INTERRUPTING COUNTING RELAY

The EICO B1 Counting Relay consists of a drive system, digit transfer contacts, zero-setting contacts and a stepping switch for electrical readout of the numbers. It can be used also as a single pole stepping switch. B1 counter uses L1 connector.

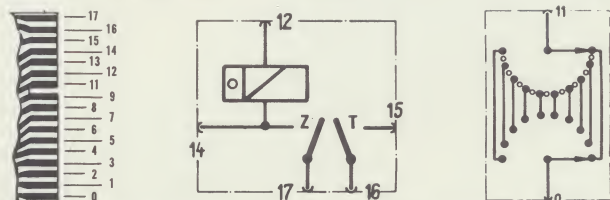
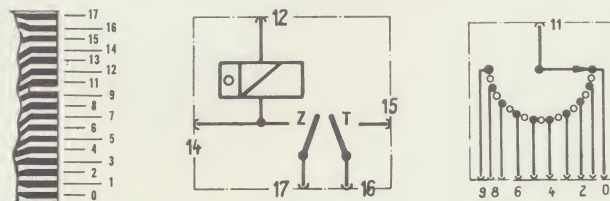
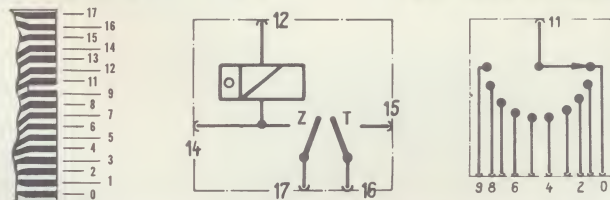
#### B2 INTERRUPTING COUNTING RELAY WITH NON-SHORTING READOUT SWITCH

Type B2 Counting Relay is basically the same as B1, except the stepping readout switch is non-shorting.

#### B3 COUNTING RELAY WITH BUILT IN PRESET SWITCH

Type B3 is of the same construction as B2, except it has a built in preset switch for manual presetting and simple programming.

If more complicated programming schemes are needed, switches from the Series "D" should be used.



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